

CLAIMS:

CM 1 1. An embossing system for embossing blank cards ✓  
2 with a plurality of vertically separated horizontally disposed  
3 lines on which characters are to be embossed with at least one  
4 line being embossed with characters of a first pitch and at  
5 least one line being embossed with characters of a second  
6 pitch comprising:

7 (a) card supply means for feeding blank cards  
8 to be embossed;

9 (b) card transporting means for receiving  
10 blank cards to be embossed from the card supply means and for  
11 transporting the cards received from the card supply means  
12 along a transport path to a plurality of separate embossing  
13 positions and to a position where embossing is completed;

14 (c) a plurality of card embossing means each  
15 disposed at a separate one of the embossing positions disposed  
16 along the transport path, each card embossing means being  
17 vertically positioned with respect to the transport path to  
18 emboss a different one of the horizontally disposed lines of  
19 characters on each card, at least one of the card embossing  
20 means embossing a character set of a first pitch on one of the  
21 horizontally disposed lines and at least another of the card  
22 embossing means embossing a character set of a second pitch on  
23 another of the horizontally disposed lines; and

24 (d) control means coupled to the card supply  
25 means, the card transporting means and the plurality of card  
26 embossing means for controlling the card supply means to feed  
27 blank cards to the card transporting means, the transporting  
28 of the cards received by the card transporting means to the  
29 separate embossing positions along the transporting path and  
30 the position where embossing is completed and the plurality of  
31 card embossing means to emboss the plurality of lines on each  
32 blank card.

1 2. An embossing system in accordance with claim 1  
2 wherein the control means compares a current longitudinal  
3 position of the cards being embossed by each of the card  
4 embossing means determined with respect to a datum point of  
5 the card transporting means with a longitudinal position of a  
6 next character to be embossed on the cards being embossed by  
7 each of the card embossing means on each of the horizontally  
8 disposed lines to identify a longitudinal position of one or  
9 more closest next characters to be embossed on any of the  
10 horizontally disposed lines which are closest to the current  
11 longitudinal position, causes the card transporting means to  
12 move to the longitudinal position of the closest one or more  
13 next characters to be embossed, and activates the one or more  
14 embossing means which are to emboss the closest one or more  
15 next character to emboss the one or more closest next  
16 characters.

1                   3. An embossing system in accordance with claim 2  
2 comprising:                     

3                   (a) a queue of buffers comprising a plurality  
4 of embosser buffers with each embosser buffer being associated  
5 with a separate card embossing means, each embosser buffer  
6 having storage locations for storing a data record comprised  
7 of all of the characters of the vertically disposed lines to  
8 be embossed for a single card, each data record including a  
9 field of characters for each line of characters to be embossed  
10 on the card with each field to be embossed by a single  
11 associated card embossing means;

P! 12                   (b) means for shifting the data records  
13 sequentially from an input, through the queue of embosser  
14 buffers in the order in which the embossers are located along  
15 the transport path, to an output; and

16                   (c) means coupled to each of the embossing  
17 buffers for sending a command to emboss the closest next  
18 character to its associated card embossing means, each card  
19 embossing means receiving commands to emboss only characters  
20 in the field of characters associated with that card embossing  
21 means.

1                   4. An embossing system in accordance with claim 2  
2 wherein the card transporting means is movable in increments                       
3 equal to a unit length divided by the product of the pitches  
4 being used for embossing.

1           5. An embossing system in accordance with claim 4  
2 wherein the closest next character to be embossed is displaced  
3 from the current longitudinal position of the card  
4 transporting means by a distance equal to an integer times a  
5 unit length divided by the product of the pitches being used  
6 for embossing.

1           6. An embossing system in accordance with claim 3  
2 wherein the controller further comprises:

01 3               (a) means for comparing the current  
4 longitudinal position of the blank cards being embossed with  
5 the data records stored in each embosser buffer to identify  
6 the position of the closest next character within the embosser  
7 buffer of the field of characters being embossed from each  
8 data record;

01 9               (b) each embosser buffer storing the position  
10 along the transport path of the next character to be embossed  
11 by its associated card embossing means which is determined by  
12 the means for comparing; and

01 13              (c) means for comparing the current  
14 longitudinal position of the cards with the longitudinal  
15 position stored in each embosser buffer to identify the one or  
16 more closest next characters.

1                   7. An embossing system in accordance with claim 1  
2 wherein:

3                   (a) each card embossing means comprises a pair  
4 of rotatable wheels mounted on a common shaft which have  
5 a space through which a blank card to be embossed is moved by  
6 the card transporting means, one of the wheels being a punch  
7 wheel carrying male embossing elements of each of the  
8 characters of the character set embossed by the punch wheel  
9 which are movable from a retracted position to an embossing  
10 position and the other wheel being a die wheel carrying female  
11 embossing elements of each of the characters of the character  
12 set embossed by the die wheel which are movable from a  
13 retracted position to an embossing position, the pair of  
14 wheels having embossing elements of each of the characters to  
15 be embossed which are disposed at different circumferential  
16 positions around the wheels and a space without embossing  
17 elements at a circumferential position which is separate from  
18 the circumferential positions of characters which is the  
19 circumferential position of the wheels when a space is to be  
20 left on a blank card;

21                   (b) a shaft encoding means for providing a  
22 signal encoding the circumferential position of the wheels  
23 with respect to a reference position; and

24                   (c) means for rotating the wheels to any one  
25 of the circumferential positions in response to a command from  
26 the control means to position the wheels for embossing a

27 particular character which is a closest next character to be  
28 embossed by the embossing means or to leave a space.

1 8. An embossing system in accordance with claim 7  
2 wherein each of the card embossing means further comprises:

3 (a) first and second rams which are movable  
4 from a first position to a second position, the first position  
5 of the first and second rams not causing the embossing  
6 elements of the wheels to emboss a character, the second  
7 position of the first ram extending to a position to contact  
8 one of the male embossing elements to cause the embossing of a  
9 character if the circumferential position having the space is  
10 not aligned therewith and the second position of the second  
11 ram extending to a position to contact one of the female  
12 embossing elements to cause the embossing of a character if  
13 the circumferential position having the space is not aligned  
14 therewith, the second position of the rams causing a single  
15 male-female pair of embossing elements of a character to move  
16 toward each other to emboss a blank card disposed  
17 therebetween; and

18 (b) means for continuously causing the rams to  
19 move from the first position to the second position and back  
20 to the first position independent of characters being  
21 embossed.

1           9. An embossing system in accordance with claim 8  
2 wherein the means to cause the rams to continuously move  
3 comprises:

4           (a) first and second pivotably mounted arms,  
5 each arm having first and second ends and a pivot point  
6 between the first and second ends, the first end of the first  
7 arm engaging an end of the first ram remote from an end of the  
8 first ram which engages a male element of the punch wheel and  
9 the first end of the second arm engaging an end of the second  
10 ram remote from an end of the second ram which engages a  
11 female element of the die wheel;

12           (b) third and fourth pivotably mounted arms  
13 each having a fixed pivot point, the third and fourth arms  
14 each having a cam follower mounted at a point offset from the  
15 fixed pivot point;

16           (c) a rotatably driven cam having an integer  
17 number of pairs of diametrically spaced lobes which cyclically  
18 move the cam followers of the third and fourth arms, the cam  
19 having a vertical axis of rotation which is orthogonal to a  
20 direction of travel of the cards held in the card transporting  
21 means;

22           (d) the third arm having means for engaging  
23 the second end of the first arm when one of the diametrically  
24 spaced lobes is engaging the cam follower of the third arm to  
25 cause the first ram to move from the first position toward the  
26 second position;

27 (e) the fourth arm having means for engaging  
28 the second end of the second arm when one of the diametrically  
29 spaced lobes is engaging the cam followers of the fourth arm  
30 to cause the second ram to move from the first position toward  
31 the second position; and

32 (f) means for rotating the cam.

1 10. An embossing system in accordance with claim 9  
2 wherein:

3 (a) each cam follower is a rotatable wheel  
4 with a peripheral surface of the wheel being in rolling  
5 contact with the cam at least when the lobes are engaged; and  
6 wherein

7 (b) the means of the third and fourth arms  
8 which respectively engages the second ends of the first and  
9 second arms is a cylindrical pin with the cylindrical surface  
10 of the pin engaging the second ends.

1 11. An embossing system in accordance with claim 9  
2 wherein each embossing means further comprises:

3 means for adjusting the vertical position of  
4 the horizontally disposed line which is embossed on a card  
5 being transported by the card transporting means.

1 12. An embossing system in accordance with claim 11  
2 wherein the means for adjusting comprises:

3 (a) a vertically extending post;



4 (b) a support base carrying the card embossing  
5 means; and

6 (c) means for clamping the support base to the  
7 vertically extending post to establish the vertical position  
8 of embossing of a line to be embossed by the embossing means  
9 carried by the support base on cards held by the transporting  
10 means.

1 13. An embossing system in accordance with claim 11  
2 further comprising:

3 means for rotating each of the cams  
4 synchronously with each other to maintain a constant  
5 rotational velocity and phase between each of the cams.

1 14. An embossing system in accordance with claim 13  
2 wherein the means for rotating each of the cams synchronously  
3 comprises:

4 (a) a wheel coupled to the cam to rotate the  
5 cam when the wheel is rotated with the wheel having teeth  
6 spaced uniformly around a peripheral surface of the wheel; and

7 (b) each of the wheels being driven by a  
8 single belt having projections which engage the teeth of the  
9 wheels, the belt being of a width which completely engages the  
10 peripheral surface of each wheel of the plurality of embossing  
11 means regardless of the vertical position of the horizontal  
12 lines being embossed.

1           15. An embossing system in accordance with claim 8  
2 wherein each card embossing means further comprises:

3           (a) a rotatably driven activation means for  
4 causing the rams to move from the first position to the second  
5 position; and

6           (b) means for rotating the rotatably driven  
7 activation means.

1           16. An embossing system in accordance with claim 15  
2 further comprising:

3           (a) means for rotating each of the means for  
4 rotating synchronously with each other to maintain a constant  
5 rotational velocity and phase between each of the rotatably  
6 driven activation means; and

7           (b) each of the activation means including a  
8 cam having an integer number of pairs of diametrically spaced  
9 lobes, first and second cam following means respectively  
10 spaced to simultaneously contact a pair of diametrically  
11 spaced lobes, the first cam following means causing the first  
12 ram to move from its first position to its second position  
13 when the first follower contacts one of the lobes of the cam  
14 and the second cam follower causing the second ram to move  
15 from its first position to its second position when the second  
16 following means contacts a second lobe.

1           17. An embossing system in accordance with claim 16  
2 wherein the activation means of each card embossing means  
3 embossing characters of the first pitch is activated by a cam  
4 having lobes rotated with a first phase and the activation  
5 means of each card embossing means embossing characters of a  
6 second pitch is activated by a cam with lobes rotated at a  
7 second phase different than the phase of the rotation of the  
8 cam having lobes activating the activation means of each card  
9 embossing means embossing characters of the first pitch.

1           18. An embossing system in accordance with claim 17  
2 wherein the activation means of each of the card embossing  
3 means for embossing characters of the second pitch is  
4 activated by a cam with lobes rotated 90° out of phase with  
5 the cam having lobes activating the activation means of each  
6 of the card embossing means embossing characters of the first  
7 pitch.

1           19. An embossing system in accordance with claim 1  
2 wherein the transporting means comprises:

3                   (a) a rotatably driven belt having a plurality  
4 of card gripping means each for holding a blank card to be  
5 embossed which are spaced apart by a uniform distance; and

6                   (b) the card embossing means being spaced  
7 apart along the transport path from each other by the uniform  
8 distance.

1 20. An embossing system in accordance with claim 19  
2 wherein the card <sup>transporting</sup> transport means further comprises a motor  
3 having a pulley for driving the belt, a single revolution of  
4 the belt being equal to an integer multiple of the uniform  
5 distance.

1 21. An embossing system in accordance with claim 20  
2 wherein the circumference of the pulley is an integer multiple  
3 of the uniform distance.

1 22. An embossing system in accordance with claim 2  
2 wherein each card embossing means comprises:

P/ 3 (a) a pair of rotatable wheels mounted on a  
4 common shaft which have a space through which a blank card to  
5 be embossed is moved by the card transporting means, one of  
6 the wheels being a punch wheel carrying male embossing  
7 elements of each of the characters of the character set  
8 embossed by that wheel which are movable from a retracted  
9 position to an embossing position and the other wheel being a  
10 die wheel carrying female embossing elements of each of each  
11 of the characters of the character set embossed by that wheel  
12 which are movable from a retracted position to an embossing  
13 position, the pair of wheels having embossing elements of each  
14 of the characters to be embossed which are disposed at  
15 different circumferential positions around the wheels and a  
16 space without embossing elements at a separate circumferential

17 position which is the circumferential position of the wheels  
18 when a space is to be left on a blank card;

19 (b) a shaft encoding means for providing a  
20 signal encoding the circumferential position of the wheels  
21 with respect to a reference position;

22 (c) means for rotating the wheels to any one  
23 of the circumferential positions in response to a command to  
24 position the wheels for embossing a particular character of  
25 the character set or to leave a space; and

26 (d) wherein the control means controls the  
27 sending of commands, to emboss the one or more characters of a  
28 first pitch or to leave a space of the first pitch and to  
29 emboss the one or more characters of a second pitch or to  
30 leave a space of the second pitch, to the respective card  
31 embossing means for embossing the characters in a timed  
32 relationship with respect to a control signal having a cycle  
33 comprised of a high and a low level, commands for embossing  
34 characters of the first pitch or to leave a space of the first  
35 pitch being sent and embossed during intervals when the  
36 control signal is high and commands for embossing characters  
37 of the second pitch or to leave a space of the second pitch  
38 being sent and embossed during intervals when the control  
39 signal is low.

1 23. An embossing system in accordance with claim 22  
2 wherein commands to emboss a character of either pitch or  
3 leave a space of either pitch are sent during a first cycle of

4 the control signal and the embossing of the character which  
5 was commanded to be embossed during the first cycle is  
6 embossed during a second cycle of the control signal.

1 24. An embossing system in accordance with claim 23  
2 further comprising means for generating a second control  
3 signal which is generated synchronously with each level of the  
4 first signal, the second signal being comprised of high and  
5 low levels, the card transporting means being moved from the  
6 current position toward the longitudinal position of the one  
7 or more next closest characters during the first level of the  
8 second control signal and the embossing of the next one or  
9 more next closest characters being embossed during intervals  
10 when the second control signal is at the second level.

1 25. An embossing system in accordance with claim 24  
2 wherein:

3 (a) each card embossing means has a  
4 continuously driven activation means for causing the embossing  
5 of a character during the second level of the second control  
6 signal;

7 (b) each of the activation means is driven  
8 synchronously with each other by a single rotary power source;  
9 and further comprising

10 (c) means for generating the first and second  
11 control signals which is driven synchronously with the  
12 activation means of the card embossing means.

1           26. An embossing system in accordance with claim 25  
2 wherein the means for generating the first and second control  
3 signals is a disk attached to one of the activation means  
4 having two concentric rings each having alternating light and  
5 dark sectors and a sensor means for respectively sensing a  
6 change in light reflected from the sectors.

1           27. An embossing system in accordance with claim 25  
2 wherein the transporting means comprises:

3                   (a) a belt having a plurality of card holding  
4 means each for holding a blank card to be embossed which are  
5 spaced apart by a uniform distance;

6                   (b) the card embossing means being spaced  
7 apart along the transport path from each other by the uniform  
8 distance; and

9                   (c) the cycle of the first control signal is  
10 equal to or greater in duration than the time required for the  
11 card embossing means for each pitch to emboss a single  
12 character.

1           28. An embosser for embossing blank cards with a  
2 line of characters extending along a line comprising:

3                   (a) a pair of rotatable wheels mounted on  
4 a common shaft which have a space through which a blank card  
5 to be embossed is moved by a card transporting means, one of  
6 the wheels being a punch wheel carrying male embossing  
7 elements of each of the characters of the character set to be

8 embossed by the punch wheel which are movable from a retracted  
9 position to an embossing position and the other wheel being a  
10 die wheel carrying female embossing elements of each of the  
11 characters of the character set to be embossed by the die  
12 wheel which are movable from a retracted position to an  
13 embossing position, the pair of wheels each having embossing  
14 elements of each of the characters to be embossed which are  
15 disposed at different circumferential positions around the  
16 wheel and a space at a separate circumferential position  
17 which is the circumferential position of the wheel when a  
18 space is to be left on a blank card;

19 (b) a shaft encoding means for providing a  
20 signal encoding the circumferential position of the wheels  
21 with respect to a reference position;

22 (c) first and second rams which are movable  
23 from a first position to a second position, the first position  
24 of the first and second rams not causing the embossing  
25 elements of the wheels to emboss a character, the second  
26 position of the first ram extending to a position to contact  
27 one of the male embossing elements to cause the embossing of a  
28 character if the circumferential position having the space is  
29 not aligned therewith and the second position of the second  
30 ram extending to a position to contact one of the female  
31 embossing elements to cause the embossing of a character if  
32 the circumferential position having the space is not aligned  
33 therewith, the second position of the rams causing a single



34 male-female pair of embossing elements of a character to move  
35 toward each other to emboss a blank card disposed  
36 therebetween;

37 (d) first and second pivotably mounted arms,  
38 each arm having first and second ends and a pivot point  
39 between the first and second ends, the first end of the first  
40 arm engaging an end of the first ram remote from an end of the  
41 first ram which engages a male element of the punch wheel and  
42 the first end of the second arm engaging an end of the second  
43 ram remote from an end of the second ram which engages a  
44 female element of the die wheel;

45 (e) third and fourth pivotably mounted arms  
46 each having a fixed pivot point, the third and fourth arms  
47 each having a cam follower mounted at a point offset from the  
48 fixed pivot point;

49 (f) a rotatably driven cam having an integer  
50 number of diametrically spaced lobes which cyclically move the  
51 cam followers of the third and fourth arms to cause the third  
52 and fourth arms to pivot about the fixed pivot points, the cam  
53 having a vertical axis of rotation which is orthogonal to a  
54 direction of travel of the cards held in the card transporting  
55 means;

56 (g) the third arm having means for engaging  
57 the second end of the first arm when one of the diametrically  
58 spaced lobes is engaging the cam follower of the third arm to

59 cause the first ram to move from the first position toward the  
60 second position;

61 (h) the fourth arm having means for engaging  
62 the second end of the second arm when one of the diametrically  
63 spaced lobes is engaging the cam follower of the fourth arm to  
64 cause the second ram to move from its first position toward  
65 its second position; and

66 (i) means for rotating the cam.

1 29. An embosser in accordance with claim 28 wherein  
2 the rams are moved simultaneously from their first position to  
3 their second position in response to the means for rotating  
4 the cam.

1 30. An embosser in accordance with claim 28 further  
2 comprising means for embossing blank cards of varying  
3 thickness with characters of uniform height during the  
4 continued operation of the means for rotating the cam.

1 31. An embosser in accordance with claim 30 wherein  
2 the means for embossing blank cards of varying thickness with  
3 characters of uniform height comprises:

4 (a) a pivot shaft functioning as the pivot  
5 point for one of the first and second arms;

6 (b) a support member having a slot having  
7 first and second ends, the pivot shaft extending through the  
8 slot and is movable between the first and second ends of the  
9 slot; and

10 (c) means for applying a biasing force to the  
11 one arm which forces the arm toward the embossing wheels by  
12 movement of the pivot shaft within the slot to force the pivot  
13 shaft to contact the first end of the slot, the biasing force  
14 opposing a reaction force applied to one of the rams during  
15 embossing of a blank card so that a reaction force exceeding  
16 the biasing force causes the pivot shaft to move toward the  
17 second end.

1 32. An embosser in accordance with claim 31 wherein  
2 the means for applying a biasing force is applied by a  
3 compressed spring which biases the pivot shaft to contact the  
4 first end of the slot.

1 33. An embosser in accordance with claim 31  
2 wherein:

3 (a) the support member is contained in a part  
4 of the common shaft with the slot being cut axially in the  
5 common shaft; and

6 (b) the pivot point for the other arm extends  
7 through another part of the common shaft.

1 34. A topper for applying a topping to embossed  
2 cards comprising:

3 (a) a card transporting means for moving cards  
4 from a wait station to a topping station where topping is  
5 applied to characters on embossed cards;

(b) a support surface having a first end and a second end, the support surface being rigid with respect to force applied between the first and second ends in a direction which is orthogonal to a surface of the card having the embossed characters;

(c) a flat surface for rigidly supporting a back surface of an embossed card located at the topping station and connected to the first end of the support surface, the back surface being the surface of the embossed card to which topping is not applied;

(d) a heated platen which is movable from a first position remote from the surface of the card which has the embossed characters to be topped to a second position at which a surface of the platen forces a topping bearing foil into contact with the embossed characters to heat fuse the topping to the embossed characters, the platen having a face which contacts the topping bearing foil in the second position and which is substantially parallel to the flat surface in moving from the first position to the second position;

(e) a suspension for supporting the platen including a base having first and second ends, first and second parallel flexible members which have a cross section with an elongated dimension being orthogonal to the direction of motion between the first and second positions and which have first and second ends, the first ends of the first and

31 second flexible members being connected respectively to the  
32 first and second ends of the base;

33 (f) an attachment plate carried by the platen  
34 having first and second parallel ends, the first and second  
35 ends of the attachment plate being respectively connected to  
36 the second ends of the first and second flexible members;

37 (g) means for moving the platen from the first  
38 position to the second position which causes the flexible  
39 members to bend while maintaining a parallel relationship with  
40 each other and the surface of the platen substantially  
41 parallel to the support surface during movement from the first  
42 position to the second position; the means for moving the  
43 platen having a movable member which is connected to the  
44 platen and being connected to the second end of the support  
45 surface; and

46 (h) a source for providing the topping bearing  
47 foil between the surface of the platen and the support  
48 surface.

1 35. A toppler in accordance with claim 34 wherein  
2 the flexible members are metallic and function to radiate and  
3 conduct heat from the heated platen.

1 36. A toppler in accordance with claim 34 further  
2 comprising:

3 (a) a rotatable support means for a roll of  
4 topping bearing foil;

5 (b) a first foil guide mounted below the  
6 heated platen and support surface;

7 (c) a second foil guide mounted above the  
8 platen and set back from the support surface to cause the foil  
9 to form an acute angle between the foil and the support  
10 surface of the card between the second guide and the card at  
11 the time the topping is fixed to the embossed characters of  
12 the card by the heated platen; and

13 (d) foil take up means for causing the foil  
14 to be unwound from the roll of foil, moved over the first foil  
15 guide, past the heated platen and support surface, over the  
16 second foil guide and to the take up means.

1 37. A topper in accordance with claim 34 wherein a  
2 slot extends between the first and second foil guides and the  
3 support surface on one side of the heated platen to permit a  
4 continuous strip of foil to be routed over the guides from the  
5 one side and an intermediate section of the support surface is  
6 disposed on the other side of the platen.

1 38. A topper in accordance with claim 37 wherein  
2 the intermediate section is narrower than the first and second  
3 ends in a direction orthogonal to the direction of motion of  
4 the platen in moving from the first position to the second  
5 position.

1           39. A topper in accordance with claim 36 wherein  
2 the second foil guide is spring biased in a first position and  
3 is pivotable from the first position in a direction toward the  
4 second end of the support surface to a second position, the  
5 acute angle being greater for the second position of the foil  
6 guide than the first position, the foil guide being pivoted  
7 toward the second position when the foil take up means is  
8 activated to cause the foil to be peeled away from contact  
9 with the embossed characters by the increase in the acute  
10 angle.

1           40. A topper in accordance with claim 35 further  
2 comprising control means for controlling the means for  
3 moving the platen to cause a force to be applied by the platen  
4 against the embossed card to be topped which is proportional  
5 to the number of characters which are embossed on the embossed  
6 card.

1           41. A topper in accordance with claim 36 wherein  
2 the take up means is programmable to set the amount of foil to  
3 be taken up after topping each card.

1           42. A topping mechanism in accordance with claim 35  
2 further comprising a transporting means for moving embossed  
3 cards from the wait station to the topping station including  
4 a channel extending from the remote station to the topping  
5 station which engages an edge of an embossed card during  
6 movement from the wait station to the topping station and

7 means for engaging an edge opposed to the edge engaged by the  
8 channel for moving an embossed card from the remote station to  
9 the topping station.

1 43. A topping mechanism in accordance with claim 42  
2 wherein the means for engaging an edge of the card opposed to  
3 the edge engaged by the channel for moving an embossed card  
4 comprises a plurality of driven rollers having their axes of  
5 rotation in a line when contacting an edge of a card disposed  
6 above the channel, each driven roller having a peripheral  
7 surface which engages the edge of an embossed card being  
8 driven from the remote station to the topping station and  
9 means for rotating each driven roller.

1 44. A topping mechanism in accordance with claim 43  
2 wherein the axis of each driven roller has a first position  
3 vertically spaced from the channel and a suspension which  
4 permits vertical deflection of the axis upward from the first  
5 position to a second position to permit cards of varying width  
6 to be moved from the remote position to the topping position.

1 45. A topper in accordance with claim 44 wherein  
2 the card transporting means further comprises an additional  
3 driven roller which engages a face of an embossed card and an  
4 idler roller which engages an opposed face of the embossed  
5 card opposite the position of the additional driven roller  
6 which moves a card to be embossed from the wait station to a  
7 first one of the driven rollers which engages an edge of an



embossed card, the additional driven roller and opposed idler roller being upstream from the other driven rollers.

3446. An embossing system for embossing blank cards with a plurality of vertically separated horizontally disposed lines on which characters are to be embossed comprising:

(a) a card hopper for holding blank cards to be embossed;

(b) means for removing a single card from the card hopper and moving the card to a card insertion position located before a pickup position at which the cards are held in a fixed position;

(c) a card transporting means for receiving blank cards at the card insertion position, moving blank cards to the pickup position and for transporting the blank cards held in a fixed position along a transport path to a plurality of embossing positions and to a position where embossing is completed, the card transporting means having a driven belt having a plurality of evenly spaced card gripping means mounted thereto for receiving successive cards at the inserting position, and during driving of the belt the individual card gripping means moving along the transport path to move cards held thereby in a straight line;

(d) each card gripping means including a leading edge gripping means and a trailing edge gripping means which are attached to the belt at spaced apart locations, each card gripping means having a slot having an opening for

25 receiving an edge of a card being moved by the means for  
26 removing, two opposed spaced apart sides and a surface  
27 connecting the sides, at the pickup position the surface  
28 connecting the sides of each of the card gripping means being  
29 substantially in line, a retaining means extending  
30 orthogonally outward from one of the sides of each of the card  
31 gripping means toward the other opposed spaced apart side,  
32 each retaining means being biased to a first position at which  
33 a card is held in the fixed position and movable from the  
34 first position to a second position at which a card engages  
35 the surface connecting the two sides;

36 (e) means for causing the retaining means of  
37 each pair of a leading edge card gripping means and a trailing  
38 edge card gripping means to move to their second position when  
39 the pair of a leading edge card gripping means and a trailing  
40 edge gripping means are moved to the card insertion position  
41 at which the means for removing and moving a single card  
42 pushes an edge of the card into engagement with each surface  
43 connecting the two sides of each of the card gripping means of  
44 the pair of a leading edge and a trailing edge gripping means  
45 and for causing the retaining means to move to their first  
46 position when each pair of a leading edge gripping means and a  
47 trailing edge gripping means moves to the pickup position;

48 (f) a plurality of embossing means located at  
49 separated embossing positions disposed along the straight line  
50 to emboss cards held by each pair of a leading edge and a

51 trailing edge card gripping means as the cards move through  
52 the embossing positions; and

PI 53 (g) control means to control the means for  
54 moving, the card transporting means and the card embossing  
55 means to control the movement of cards from the hopper to the  
56 card insertion position, the movement of the card transporting  
57 means to move the cards to the embossing positions and the  
58 plurality of embossers to emboss characters on the cards as  
59 the cards are positioned at the embossing positions.

1 35 47. An embossing system in accordance with claim 34  
2 wherein the trailing edge card gripping means has means for 46  
3 pushing a card to a reference position with respect to the  
4 transport path when the leading edge and trailing edge card  
5 gripping means are at the card insertion position.

1 36 48. An embossing system in accordance with claim 35  
2 wherein the means for pushing the card to the reference 47  
3 position is a member which projects outward through a plane  
4 contained within the slot of the card gripping means.

1 37 49. An embossing system in accordance with claim 36  
2 wherein the member is mounted on the trailing edge card 48  
3 gripping means at a point upstream of the surface connecting  
4 the spaced apart sides.

1           38 ~~50~~<sup>34</sup>. An embossing system in accordance with claim ~~46~~<sup>46</sup>  
2 wherein the control means causes the means for removing and  
3 moving the card into contact with the surface connecting the  
4 two sides of the leading edge gripping means and the trailing  
5 edge gripping means with a predetermined force.

1           39 ~~51~~<sup>38</sup>. An embossing system in accordance with claim ~~50~~<sup>50</sup>  
2 wherein the predetermined force is produced by a motor which  
3 pushes the card into contact with the surface connecting the  
4 two sides of the leading edge gripping means and the trailing  
5 edge gripping means to stall the motor and the control means  
6 applies a command for the motor in the stalled condition to  
7 produce a constant torque.

1           40 ~~52~~<sup>34</sup>. An embossing system in accordance with claim ~~46~~<sup>46</sup>  
2 wherein the means for causing the retaining means of each pair  
3 of a leading edge card gripping means and a trailing edge  
4 gripping means to move to the second position at the card  
5 insertion position comprises:  
6                   (a) a cam located at the card insertion  
7 position; and  
8                   (b) cam following means carried by each pair  
9 of a leading edge card gripping means and trailing edge  
10 gripping means which engages the cam to move the retaining  
11 means to their second position as long as the cam engages the  
12 cam followers.

34

1           41 53. An embossing system in accordance with claim 46  
2 further comprising means located at the position where  
3 embossing is completed to cause the retaining means of each  
4 pair of a leading edge card gripping means and trailing edge  
5 card gripping means to move to their second position to  
6 release a card from engagement of the pair of leading and  
7 trailing edge card gripping means.

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1           42 54. An embossing system in accordance with claim 53  
2 wherein the means for causing the retaining means of each pair  
3 of a leading edge card gripping means and a trailing edge card  
4 gripping means to move to a second position at the position  
5 where embossing is completed comprises:

6                   (a) a cam located at the position where  
7 embossing is completed; and

8                   (b) cam following means carried by each pair  
9 of a leading edge card gripping means and a trailing edge  
10 gripping means which engages the cam to move to the retaining  
11 means to the second position as long as the cam engages the  
12 cam followers.

34

1           43 55. An embossing system in accordance with claim 46  
2 further comprising:

3                   (a) a flat reference surface which is parallel  
4 to the straight line; and wherein

5                   (b) each pair of a leading edge gripping means  
6 and a trailing edge gripping means is pushed into contact with

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7 the reference surface when the means for removing and moving  
8 positions the card at the card insertion position so as to  
9 ensure that the card engages the surface connecting the sides.

1 <sup>43</sup>  
2 <sup>44</sup>56. An embossing system in accordance with claim 55  
3 wherein each leading edge and trailing edge gripping means has  
4 means for suspending the gripping means with rolling contact  
a on the reference surface to minimize <sup>friction</sup> function.

1 <sup>45</sup>57. An embossing system for embossing blank cards  
2 with a plurality of vertically separated horizontally disposed  
3 lines on which characters are to be embossed comprising:

4 (a) card supply means for feeding blank cards  
5 to be embossed;

6 (b) card transporting means for receiving  
7 blank cards to be embossed from the card supply means and for  
8 transporting the cards received from the card supply means  
9 along a transport path to a plurality of separate embossing  
10 positions and to a position where embossing is completed;

11 (c) a plurality of card embossing means each  
12 disposed at a separate one of the embossing positions along  
13 the transport path, each card embossing means being vertically  
14 positioned with respect to the transport path to emboss a  
15 different one of the horizontally disposed lines of characters  
16 on each card; and

17 (d) control means coupled to the card supply  
18 means, the card transporting means and the plurality of card  
19 embossing means for controlling the card supply means to feed  
20 blank cards to the card transporting means, the transporting  
21 of the cards received by the card transporting means to the  
22 separate embossing positions along the transporting path and  
23 the position where embossing is completed, the plurality of  
24 card embossing means to emboss the plurality of lines on each  
25 blank card, and comparing a current longitudinal position of  
26 the cards being embossed by each of the card embossing means  
27 determined with respect to a reference point with a  
28 longitudinal position of a next character to be embossed on  
29 the cards being embossed by each of the card embossing means  
30 on each of the horizontally disposed lines to identify a  
31 longitudinal position of one or more closest next characters  
32 to be embossed on any of the horizontally disposed lines which  
33 are closest to the current longitudinal position, moving the  
34 card transporting means to the longitudinal position of the  
35 closest one or more next characters to be embossed, and  
36 activating the one or more embossers which are to emboss the  
37 closest one or more next characters to emboss the one or more  
38 closest next characters.

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1 58. An embossing system in accordance with claim 9

2 wherein:

01 3 (a) the means of the third and fourth arms  
4 which respectively engages the second ends of the first and  
5 second arms has a point of contact;

01 6 (b) the third arm has a centerline extending  
7 through the pivot point of the third arm, the center of the  
8 cam follower of the third arm and the means of the third arm  
9 which engages the second end of the first arm, the centerline  
10 moving through an arc and being defined by it being orthogonal  
11 to the common shaft;

01 12 (c) the fourth arm has a centerline extending  
13 through the pivot point of the fourth arm, the center of the  
14 cam follower of the fourth arm and the means of the fourth arm  
15 which engages the second end of the second arm, the centerline  
16 moving through an arc and being defined by it being orthogonal  
17 to the common shaft; and

01 18 (d) the movement of the point of contact of  
19 the third arm being equally disposed about the centerline of  
20 the third arm and the movement of the point of contact of the  
21 fourth arm being equally disposed about the centerline of the  
22 fourth arm.



46  
1 47 59. An embossing system in accordance with claim 58  
2 wherein: —

3 (a) each cam follower is a rotatable wheel  
4 with a peripheral surface of the wheel being in rolling  
5 contact with the cam at least when the lobes are engaged; and

6 (b) the means of the third and fourth arms  
7 which respectively engages the second ends of the first and  
8 second arms is a cylindrical pin with the cylindrical surface  
9 of the pin engaging the second ends.

1 48 60. An embossing system in accordance with claim 28  
2 wherein: —

3 (a) the means of the third and fourth arms  
4 which respectively engages the second ends of the first and  
5 second arms has a point of contact;

6 (b) the third arm has a centerline extending  
7 through the pivot point of the third arm, the center of the  
8 cam follower of the third arm and the means of the third arm  
9 which engages the second end of the first arm, the centerline  
10 moving through an arc and being defined by it being orthogonal  
11 to the common shaft;

12 (c) the fourth arm has a centerline extending  
13 through the pivot point of the fourth arm, the center of the  
14 cam follower of the fourth arm and the means of the fourth arm  
15 which engages the second end of the second arm, the centerline  
16 moving through an arc and being defined by it being orthogonal  
17 to the common shaft; and

18 (d) the movement of the point of contact of  
19 the third arm being equally disposed about the centerline of  
20 the third arm and the movement of the point of contact of the  
21 fourth arm being equally disposed about the centerline of the  
22 fourth arm.

1 49<sup>48</sup> ex. An embossing system in accordance with claim 60  
2 wherein:

3 (a) each cam follower is a rotatable wheel  
4 with a peripheral surface of the wheel being in rolling  
5 contact with the cam at least when the lobes are engaged; and

6 (b) the means of the third and fourth arms  
7 which respectively engages the second ends of the first and  
8 second arms is a cylindrical pin with the cylindrical surface  
9 of the pin engaging the second ends.